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Center for Advanced Infrastructure & Transportation  
Rutgers, The State University of New Jersey

NJDOT Bureau of Research  
QUARTERLY PROGRESS REPORT

Project Title:	Rut Testing of Hot Mix Asphalt		
RFP NUMBER:	NJDOT RESEARCH PROJECT MANAGER: W. Lad Szalaj		
TASK ORDER NUMBER/Study Number: Task Order No. 98 / 4-26677	PRINCIPAL INVESTIGATOR: Dr. Ali Maher		
Project Starting Date: 1/01/2003 <b>Original</b> Project Ending Date: 12/31/2003 <b>Modified Completion Date:</b>	Period Covered: 2 <sup>nd</sup> Quarter 2004		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search/Local Agency Survey	10%	0%	100%	10%
Lab Testing for Rutting Criteria	25%	0%	100%	25%
Lab Testing for NJ HMA Characterization	25%	10%	100%	25%
Lab Testing for SUPERPAVE vs Marshall	20%	15%	100%	20%
Field Calibration/Evaluation	10%	55%	100%	10%
Final Report	10%	25%	100%	10%
TOTAL	100%			100%

Project Objectives:

- Select 4 pavement surfaces on New Jersey low volume roads that are performing well (and have performed well for a number of years) and are designed using the Marshall design process
- Obtain the original job mix formula for each location, sample materials from the identical material source, and conduct the Marshall design in the laboratory to compare to the JMF
- Using the identical materials, perform the Superpave design process and compare the volumetric results to the Marshall design values
- Test both design samples under the Asphalt Pavement Analyzer (APA) and permeability
- Determine the appropriate number of design gyrations needed by the Superpave design method to provide identical volumetric properties as the Marshall design

Project Abstract:

Currently, local aide utilizes the Marshall design for HMA materials on local roads. However, by 2005, the NJDOT will not provide specification for Marshall design, only for Superpave design, thus simplifying both the testing specifications and the design books at the suppliers. Unfortunately, many local aide engineers are resisting the move to Superpave because they feel it may be too complicated and not provide the same performance as the time test Marshall mixes.

The research was to evaluate four Marshall mixes that are performing well in the field and evaluate them under the Superpave design methodology. Volumetric analysis and performance testing were also conducted to evaluate if differences exist between the two mixes. The end result of the work being a document that the local aide can use to illustrate that only minor to no differences exist between the two design methodologies when designing low volume roads.

The final outcome of the study indicated that the four good-performing Marshall design mixes would still have been compliant under Superpave 9.5 mm design specifications. The Marshall design mix gradation were then used to conduct the Superpave design method on the identical gradation. The results indicated that the difference in final asphalt binder content ranged from 0.1% to 0.5%, depending the on the source. Performance testing, rutting and fatigue, were conducted on both the Marshall design and the Superpave design mixes. The results were mixed, sometimes showing that the Superpave mixes had better rutting and fatigue properties, while other times the



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Marshall mixes had better rutting and fatigue properties. No correlation to volumetric properties was found to explain the performance trends.

Overall, the study concluded that the Marshall design and Superpave design, when used to the design of HMA for low volume roads, provides similar laboratory performance when evaluating both the rutting and fatigue properties. The results also showed that the number of gyrations (from the Superpave gyratory compactor) needed to produce identical volumetric properties as the 50-blow Marshall sample correlated well to the bulk specific gravity of the aggregates used in the HMA gradation. (i.e. the higher the bulk specific gravity, the lower the number of gyrations needed). The needed number of gyrations also showed a similar correlation to the maximum specific gravity of the HMA. The needed number of gyrations ranged from 32 to 77, with an average of 60.

1. Progress this quarter by task:

A final report was generated and will be delivered to NJDOT for review on the date of the Quarterly meeting.

2. Proposed activities for next quarter by task:

N.A.

3. List of deliverables provided in this quarter by task (product date):

N.A.

4. Progress on Implementation and Training Activities:

N.A.

5. Problems/Proposed Solutions:

N.A.

Total Project Budget	\$391,867.00
<b>Modified Contract Amount:</b>	
Total Project Expenditure to date	\$391,867.00
% of Total Project Budget Expended	100%

\* These are approximate expended amounts for the project; these estimates are for reference only and should not be used for official accounting purposes. For a more accurate project accounting please review the quarterly invoice for this project.